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1) (a) According to ISO definition (ISO, 1997), a software includes four basic components. List down the four (4) basic components of a software. (4 marks)

Computer programs,
Procedures,
Documentation,
Data necessary for operating the software system.

(b) There are seven statements made by the testing teams during different types of static reviews. Select the correct review type for each of the statements using the numbered list given below. Write down the sequence number of the correct choice in the box provided in front of the category. (1x7 = 7 marks)

List of static review types:

1 Informal (Pair review)
2 Walkthrough
3 Technical review
4 Inspection

1	Hey, I noticed you are using a custom function here - want to use the built-in one instead?	1
2	From a user perspective, this input validation could be stricter—have you considered unexpected characters?	2
3	Let us test this logic together, I think there might be an edge case we are missing.	1
4	In this part of the code, can you explain why you chose to use a linked list instead of an array?	2
5	On line 47, the variable name temp2 is not descriptive—violates naming convention rule ID-03.	4
6	This module does not follow our logging standard—please use the centralized logger with context tags.	3
7	The algorithm's complexity seems to be $O(n^2)$. Could we optimize it for better performance?	3

(c) State whether the following statements are true (T) or false. (1x10 =10 marks)

1. Regression testing is done before fixing bugs or updating the system to make sure nothing breaks.	F
2. In white-box testing, testers can see and use the code while testing.	T
3. Decision, branch, and condition coverage are key methods used in white-box testing.	T
4. White-box testing checks how the software works inside, not just what it does on the outside.	T
5. Finite State Machine testing checks if the software moves correctly between different states (used in black-box testing).	T
6. Stress testing checks if the software can handle a lot of pressure or heavy use without crashing.	T
7. Static testing helps prevent problems, while dynamic testing helps find and fix them.	T
8. Writing test scenarios, test cases, and preparing test data are part of making tests.	T
9. Bugs go through different stages like New, In Progress, Deferred, etc., as they are being fixed.	T
10. Integration testing finds problems with how different parts of the system work together.	T

(d) List down four (4) features of good test cases. (4 marks)

Simple and transparent.
- Have 100% coverage.
- Must be identifiable.
- Should be according to the minds of the clients.
- Likely to be revised and updated regularly.
- Likely to be used by developers and developers.

2) (a) Selenium is a free and open-source test automation suite which is widely being used in web applications. It supports test automation across different browsers, platforms, and programming languages. Name and explain the four components of Selenium suite. (12 marks)

Selenium WebDriver

Selenium WebDriver can be used to create robust, browser-based regression automation suites and tests and to scale and distribute scripts across many environments. tIt is a collection of language specific bindings to drive a browser. It provides different drivers for different browsers such as Chrome, Firefox, Safari etc. while supporting multiple programming languages.

Selenium IDE

Selenium IDE is a Chrome, Firefox and Edge add-on that will do simple record-and-playback of interactions with the browser. The record and playback feature provided by the IDE makes the testing process easier even for the people with no or limited programming language experience. The IDE can be used to create quick bug reproduction scripts, and to create scripts to aid in automated testing.

Selenium Grid

Selenium Grid helps in the distributed running of Selenium tests in parallel across multiple remote machines. It facilitates scaling by distributing and running tests on several machines. It has the ability to manage multiple environments from a central point, making it easy to run the tests against a vast combination of browsers or Operating Systems. Selenium Grid is comprised with a Hub and Nodes architecture. The nodes run the Selenium instances on which the test cases are executed. The central hub has multiple connecting nodes and acts as a server to control the whole test execution.

Selenium Remote Controller

This feature is currently not available as a component of Selenium. It was used to inject the javascript code in the browser for automation and required an additional server for running the automation scripts.

(b) What is Software test automation? (4 marks)

Automation Testing is the use of software tools to develop and execute tests.

Tools used in test automation can enter test data into the applications, compare expected and actual results and generate reports.

(c) Write down five advantages of software test automation.

(5 marks)

Speed : Test Automation is faster when compared to manual testing.

Reliable : Automated tests can perform same operation precisely each time.

Repeatable: Tests can be repeated easily.

Coverage: Test Automation increase coverage.

Reusable : Test can be reused in different application versions.

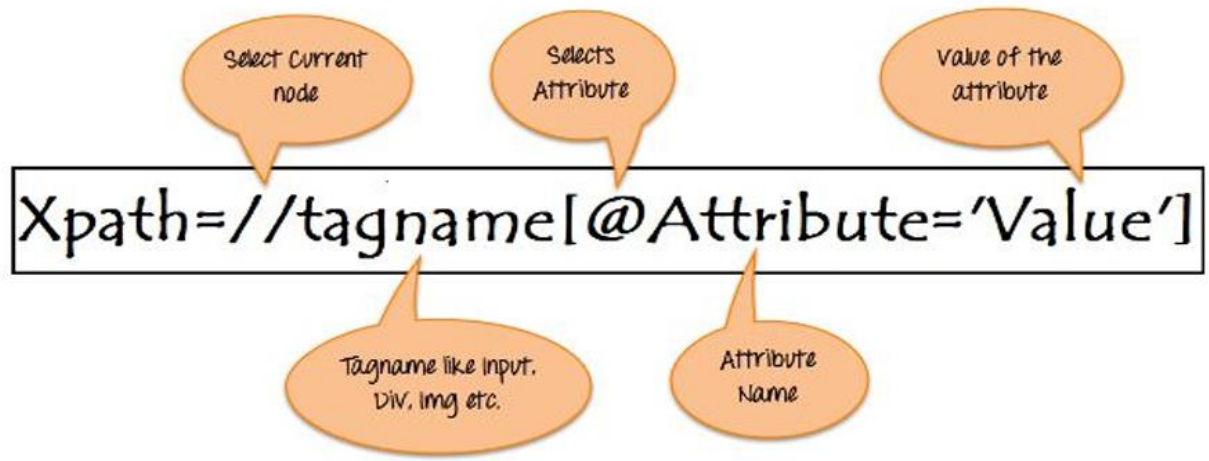
(d) "Software test automation is not always possible". State whether the statement is true or false. Justify your answer with an example. (4 marks)

True

Suitable example would earn full marks.

3) (a) XPath is one of the most popular html element locators in Test Automation. Briefly explain the general XPath format using an example.

(5 marks)



/ (Slash): Refers to the root element, and the subsequent elements are selected from this root.

[axis]: Specifies the direction or relationship of the element. For example, `child`, `parent`, etc.

tagname: The name of the HTML tag or element you're targeting (e.g., `div`, `input`, `a`).

@attribute='value': A condition that filters the element based on its attribute (e.g., `id`, `class`, `name`), and it matches elements with a specific attribute value.

(b) Write down three (03) alternative techniques to locate elements in an HTML document other than XPath.

(3 marks)

Name Locator

ID Locator

CSS Locator

(c) Write the correct relative XPath for the given scenarios. (2x5 = 10 marks)

i) Write an XPath to select the input element where the *id* is *"username"*.

```
<div>
    <input type="text" id="username" name="user" />
    <input type="password" id="pass" name="password" />
</div>
```

//input[@id='username']

ii) Write an XPath to select the list item (<li>) that contains the text *"Contact"*.

```
<ul>
    <li>Home</li>
    <li>About</li>
    <li>Contact</li>
</ul>
```

//li[text()='Contact']

iii) Write an XPath to select the with class containing the word *"success"*.

```
<div class="notification success">Success! Your file was uploaded.</div>
<div class="notification error">Error! Please try again.</div>
```

//div[contains(@class, 'success')]

iv) Write an XPath to select the second `<li>` element in the list.

```
<ol>
    <li>Step One</li>
    <li>Step Two</li>
    <li>Step Three</li>
</ol>
```

```
//ol/li[2]
```

v) Write XPath to capture *'h2'* node using *text()* function.

```
<div class="product">
    <h2>Item 1</h2>
    <span class="price">$10</span>
</div>
<div class="product">
    <h2>Item 2</h2>
    <span class="price">$20</span>
</div>
```

(d)

```
//div[h2[text()='Item 2']]/span[@class='price']
```

Write down the correct XPath axis name in front of the given definitions. (7 marks)

Selects all immediate (direct) children of the current node	child
Selects the **immediate parent** of the current node.	parent
Selects **all ancestors** of the current node, all the way up to the root.	ancestor
Selects all siblings *after* the current node.	following-sibling
Selects all nodes that come **before** the current node in the document, except for ancestor nodes.	preceding

Selects the current node itself	self
selects all siblings *before* the current node.	preceding-sibling

4) (a) Write down whether the following statements are true or false. (10 marks)

TestNG XML files are used to define test suites, test groups, and the order in which tests should be executed.	(True)
In a TestNG XML file, you can specify parameters to be passed to test methods at runtime.	(True)
TestNG XML files are mandatory for executing tests in TestNG; tests cannot run without them.	(False)
A single TestNG XML file can only define one test suite and cannot include multiple test configurations.	(False)
The Page Object Model (POM) is a design pattern that promotes code reusability by creating an object repository for web elements.	(True)
Selenium requires the use of the Page Object Model to be effective in automating tests.	(False)
Using POM helps in reducing code duplication and improves the maintainability of test scripts.	(True)
Assertions are used in testing to verify that the expected outcome matches the actual outcome of a test case.	(True)
Assertions are only used in unit testing and are not applicable to integration or functional testing.	(False)
Assertions can be categorized into different types, such as soft assertions and hard assertions and regular assertions based on how they handle test failures.	(False)

(b) State whether the following statements are **true** or **false** regarding software test automation frameworks. (1x5 = 5 marks)

Data Driven Automation Frameworks allow test scripts to run with different data sets without modifying the script itself.	(True)

Hybrid Automation Frameworks combine elements of both data-driven and keyword-driven frameworks to enhance flexibility and maintainability.	(True)
Keyword Driven Automation Frameworks require testers to have programming knowledge to create and execute test cases effectively.	(False)
Linear Automation Frameworks are best suited for complex applications with numerous interactions due to their structured approach.	(False)
Library Architecture in test automation frameworks focuses on organizing reusable functions and libraries to promote code reuse and reduce redundancy.	(True)

(c) Write down the output of the following TetsNG programme in the given box. Note: Use your knowledge of TestNG annotations execution sequence. (5 marks)

```
public class it6206 {

    @BeforeMethod
    public void beforeMethod() { System.out.println("A"); }

    @AfterMethod
    public void afterMethod() { System.out.println("A"); }

    @AfterTest
    public void afterTest() { System.out.println("C"); }

    @BeforeTest
    public void beforeTest() { System.out.println("B"); }

    @Test(priority=1)
    public void testCase2() { System.out.println ("Test "); }

}
```

Write the output here
B
A
Test
A
C

(d) Write down suitable selenium commands to perform given actions below using Java. (5 marks)

i) Create a WebDriver instance using ChromeDriver

```
WebDriver driver = new ChromeDriver();
```

ii) Open the Webpage “http://ucsc.lk”.

```
Open the Webpage “http://ucsc.lk”.
```

iii) Click on the button. The button's xpath is //input[@id=" btn"].

```
driver.findElement(By.xpath("//input[@id='btn']")).click()
```

iv) Select the Option "Sri Lanka" from a Dropdown. The dropdown element XPath is //select[@id="country"]

```
WebElement dropdown = driver.findElement(By.xpath("//select[@id='country']"));
Select select = new Select(dropdown);
select.selectByVisibleText("Sri Lanka");
```

v) Close browser

```
driver.quit() or driver.close()
```

*****